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Headlight unit for a motor vehicle

The present invention relates to a headlight unit for a motor vehicle, in particular a passenger car.

Such a headlight unit usually comprises a housing which can be fixed to a vehicle body. Two or more light sources, normally incandescent bulbs or LEDs (light-emitting diodes) in the case of modern vehicles, are generally accommodated in the housing in order to produce, for example, an indicator light, a lower beam, a parking light, an upper beam, a rear light, a braking light or a reversing light.

In order to always be able to satisfy increasing safety requirements, increasingly powerful light sources are used in the headlight units which have greater light output powers. In particular in the case of incandescent bulbs, but also in the case of LEDs, an increase in the power also involves an increase in the heat emitted by the respective light source. Whilst this is comparatively unproblematic in the case of incandescent bulbs, the heat resistance of LEDs is restricted to comparatively low temperatures (approximately 120°C). The use of two or more LEDs having increased power, for example for the purpose of producing a lower beam, may therefore lead to thermal problems.

Here, the invention intends to remedy this. The present invention is concerned with the problem of specifying an improved embodiment for a headlight unit of the type mentioned initially with which, in particular, a temperature increase during operation is reduced.

This problem is achieved according to the invention by the subject matter of the independent claim.

Advantageous embodiments are the subject matter of the dependent claims.

The invention is based on the general concept of passing at least some of the heat produced during operation of the at least one light source out of the housing of the headlight unit with the aid of a heat-conducting device. With the aid of such a heat-conducting device, it is thus possible for a thermally conductive bridge from the interior of the housing into the environment of the housing to be established which assists in preventing an undesirably high temperature increase in the housing. In order to attain a particularly effective thermal bridge, the invention proposes that the heat-conducting device be connected, so as to transmit heat, at one end to the at least one light source or to a reflector associated with the at least one light source and at the other end to a zone of the vehicle body when the headlight unit has been installed, this zone of the vehicle body being selected such that it is particularly suitable for heat dissipation. For example, this zone is formed on a metal mount on which the headlight unit is fixed when it is installed. As a result, the heat passed out of the housing can dissipate comparatively rapidly into the metal components of the vehicle body.

Of particular advantage is a development in which the heat-conducting device has a stationary section, which has an output end section of the heat-conducting device and is arranged in the housing such that it is fixed in position, and a flexible section, which has an input end section of the heat-conducting device, is connected to the stationary section so as to transmit heat and can follow or be carried along with relative movements between the at least one light source and/or the reflector on the one hand and the housing on the other hand. This design makes it possible for the heat-

conducting device to adapt to changing positions of the light source or the reflector within the housing and to continue to ensure the dissipation of the heat produced by the light source. Such a design is of primary importance when such changes in the relative position between the housing and the at least one light source or the reflector regularly come about during operation of the vehicle. For example, the headlight unit may be designed to realize a cornering light which follows the steering angle of the vehicle. The headlight unit may likewise be designed such that changes in the inclination of the vehicle longitudinal axis with respect to the roadway can be compensated for in order to be able to adjust the headlight beam. In order for it to be possible for these additional functions to be realized, the at least one light source or the associated reflector needs to be held or mounted in a suitable manner in the housing such that it can be adjusted. The flexible section of the heat-conducting device is dimensioned such that it can easily follow all of the relative positions occurring during normal operation, with the result that the desired heat dissipation is always realized.

Further important features and advantages of the invention are given in the subclaims, the drawings and the associated description of the figures with reference to the drawings.

It goes without saying that the features which have been described above and are yet to be described below can be used not only in the respectively cited combination but also in other combinations or on their own, without leaving the realms of the present invention.

One preferred exemplary embodiment of the invention is illustrated in the drawings and will be explained in

more detail in the description below.

The single figure 1 shows a very simplified longitudinal section through a headlight unit according to the invention.

As shown in figure 1, a headlight unit 1 according to the invention has a housing 2. The headlight unit 1 can be installed in a motor vehicle, in particular in a passenger vehicle, and forms there a front illumination system or a rear illumination system on one side of the vehicle. The housing 2 can be fixed for this purpose on a vehicle body 3 which is represented here merely by a transverse mount 4.

At least one light source 5 is arranged in the housing 2 for the purpose of producing a vehicle light, in particular a lower beam. In the present case, a large number of individual light sources 5 are combined to form one unit. The light sources 5 are in this case formed by, for example, LEDs. The light sources 5, which are associated with one light of the headlight unit 1, for example, the lower beam, are actuated simultaneously for the purpose of producing the respective light.

The light sources 5 are in this case fitted on a common mount 6. This mount 6 is coupled to each of the light sources 5 so as to transmit heat such that the light sources 5 emit at least some of the heat produced during operation to the mount 6. The mount 6 is mounted on a holder 7 such that it can pivot about a horizontal pivot axis 8 which is on the plane of the drawing by means of side flanges (not shown). The holder 7 is for its part mounted on a bracket 9 such that it can rotate about a vertical axis of rotation 10 which lies on the plane of the drawing. Furthermore, the bracket 9 makes possible an adjustment on a horizontal plane which lies

on the plane of the drawing.

The mount 6 has a reflector 11 associated with the light sources 5 or merges with this reflector 11. In any case, the reflector 11 is in this case coupled to the mount 6 at 12 so as to transmit heat.

The particular embodiment shown here thus makes it possible, on the one hand, to adjust the illuminated area which is produced by the headlight unit 1 during normal operation and in which the mount 6 together with its light sources 5 and the reflector 11 are correspondingly moved on the adjustment plane of the bracket 9. This adjustment is carried out once in the factory and should be readjusted at relatively long time intervals when maintenance work is carried out. With this adjustment the relative position between the light sources 5 and the reflector 11 on the one hand and the housing 2 on the other hand is altered.

Furthermore, the embodiment shown here makes possible an adjustment of the inclination of the headlight beam produced in which the mount 6 with the light sources 5 and the reflector 11 is pivoted about the pivot axis 8. This possibility for adjustment is required, for example, for headlight beam adjustment for the purpose of compensating for a change in the inclination of the vehicle longitudinal axis with respect to the roadway. Such a change in the inclination may result, for example, in the case of different load states or in the case of the vehicle being accelerated or braked. Modern motor vehicles or modern headlight units 1 in this case have a corresponding inclination adjustment device which compensates for the effects of the change in inclination on the illuminated area produced by means of a pivoting movement of the light sources 5 and the reflector 11 about the pivot axis 8. Even in the case of these pivoting movements, the relative position

between the housing 2 on the one hand and the light sources 5 and the reflector 11 on the other hand is changed.

Furthermore, the particular embodiment shown here makes possible rotations of the mount 6 with the light sources 5 and the reflector 11 about the axis of rotation 10. Modern motor vehicles, in particular modern headlight units, may be equipped with an apparatus for the purpose of producing a cornering light, this cornering light following a steering angle of the vehicle. Corresponding actuating elements then drive the light sources 5 and the reflector 11, as a function of the steering angle, to make a rotary movement about the axis of rotation 11. Even in the case of this rotary movement, the relative position between the housing 2 on the one hand and the light sources 5 or the reflector 11 on the other hand is changed.

The housing 2 also comprises a frame part 13 and a lens (not shown) through which the light produced by the light sources 5 emerges from the housing 2.

According to the invention, the housing 2 is now equipped with a heat-conducting device 14 which makes it possible to pass heat, which is produced in the housing 2 during operation of the light sources 5, out of the housing 2. For this purpose, an input end section 15 of the heat-conducting device 14 is coupled so as to transmit heat directly to the reflector 11 and thus indirectly to the mount 6 and indirectly to the light sources 5. Furthermore, the heat-conducting device 14 has an output end section 16 which is passed out of the housing 2 and is designed such that it can be connected to a zone 17 of the vehicle body 3 so as to transmit heat. In the example shown here, this zone 17 is formed on the transverse mount 4 and is in this

case selected such that it is particularly suitable for heat dissipation.

Of particular importance here is the fact that the heat-conducting device 14 extends from its input end section 15 up to its output end section 16 within the housing 2 and is only passed out of the housing 2 with its output end section 16. This design is advantageous if the housing 2 is subjected, owing to the installation situation, to other heat sources of the vehicle, in particular in the engine area. A heat-conducting device which extends outside the housing 2 could be counterproductive if it transmits heat, for example emitted from the engine area, into the interior of the housing 2 and thus onto the reflector 11 and finally onto the light sources 5. In the case of such an installation situation, it may also be expedient for the housing 2 to be designed to be thermally insulating.

The heat-conducting device 14 has a stationary section 18 and a flexible section 19. The stationary section 18 is connected, so as to transmit heat, at one end to the output end section 16 and at the other end to the flexible section 19. Furthermore, the stationary section 18 is accommodated, in particular fixed, in the housing 2 such that it is fixed in position. The stationary section 18 is produced, for example, from a comparatively stiff strip, in particular a metal strip.

In contrast thereto, the flexible section 19 is connected, so as to transmit heat, at one end to the input end section 15 and at the other end to the stationary section 18. The flexible section 19 is designed such that it can follow the above-described relative movements between the light sources 5 and the reflector 11 on the one hand and the housing 2 on the other hand, without the heat-transmitting coupling of

the heat-conducting device 14 with the reflector 11 being interrupted in the process. It is thus possible for the heat to be transported from the reflector 11 out of the housing 2 for all relative positions which can be set between the housing 2 and the mount 6 with the light sources 5 and the reflector 11.

The flexible section 19 is made of, for example, at least one flexible strip, in particular a metal strip. Such a strip may be, for example, knitted, i.e. may be made of a wire mesh. The strip may likewise be composed of a plurality of components and as a result be physically ductile.

In the present case, the stationary section 18 comprises at least one strip 20 which is coupled to the flexible section 19 so as to transmit heat. The strip 20 is laid in the housing 2 and extends up to the frame part 13 and may be connected to said frame part 13 so as to transmit heat in accordance with a preferred embodiment. In this embodiment, the frame part 13 in this case forms part of the stationary section 18 of the heat-conducting device 14. The strip 20 is also connected to a lug 21 so as to transmit heat, this lug 21 in this case being formed by the outlet end section 16. The lug 21 thus passes through the housing 2. Furthermore, the lug 21 may also be connected to the frame part 13 so as to transmit heat, as a result of which the strip 20 can be coupled indirectly, via the frame part 13, or directly to the lug 21 so as to transmit heat.

In the embodiment shown here, the lug 21 of the heat-conducting device 14 has a dual function, since the housing 2 is held on the vehicle body 3 with the aid of this lug 21 in the installed state. This means that the lug 21 brings about or contributes to the holding of the housing 2 on the vehicle body 3. It is clear that

the heat-conducting device 14 may have two or more flexible sections 19 and/or two or more strips 20 and/or two or more lugs 21. The number of and dimensions for the individual components of the heat-conducting device 14 in this case depend on the heat which is expected and which may be produced during continuous operation of the light sources 5 under unfavorable environmental conditions.

In order for the heat-conducting device 14 to have particularly good heat conductance, its individual components are expediently produced from a material which is particularly suitable for heat conduction, such as metal, in particular copper or a copper alloy.

The headlight unit 1 according to the invention functions as follows:

During operation of the light sources 5, said light sources 5 also emit heat, symbolized by arrows 23, in addition to light, symbolized by arrows 22. The emitted heat is thus transmitted to the reflector 11. Furthermore, heat produced during the light generation is passed directly from the light sources 5 into the mount 6 and from this mount into the reflector 11. The heat passes from the reflector 11 into the input end section 15 of the heat-conducting device 14. Then, the heat passes from the input end section 15, via the flexible section 19 and the stationary section 18, into the output end section 16 of the heat-conducting device 14. Then, finally, the heat passed out of the housing 2 passes from the output end section 16, via the zone 17, into the transverse mount 4, from where it dissipates into the vehicle body 3. It is clear that the transverse mount 4 is expediently likewise made of metal and is connected to further metal parts of the vehicle body 3.

The flexible section 19 of the heat-conducting device 14 in this case ensures the undisrupted transport of the heat produced during operation away out of the housing 2 to a sufficient extent for relative adjustments between the housing 2 and the adjustable unit comprising the mount 6, the light sources 5 and the reflector 11.